# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 05-174985
(43)Date of publication of application : 13.07.1993

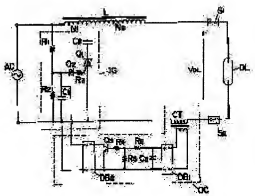
(51)Int.Cl. H05B 41/18
H05B 41/18

(21)Application number : 03-340442
(22)Date of filing : 24.12.1991

(71)Applicant : MATSUSHITA ELECTRIC WORKS LTD
(72)Inventor : FUKUMORI NORIYUKI
ARAKAWAUCHI NOBORU
UCHIHASHI MASAAKI

(54) DISCHARGE LAMP LIGHTING DEVICE

(57)Abstract:
PURPOSE: To provide a discharge lamp lighting device wherein a fine discharge is prevented from being generated at the time of restarting so that large electrical stress is prevented from being applied to a connecting terminal or the like.
CONSTITUTION: A discharge lamp DL and a stabilizer L are connected in series, and this series circuit is connected between both ends of an AC power supply AC. An igniter IG for applying a high voltage pulse overlapped with voltage of the AC power supply AC to the discharge lamp DL is provided. In a lighting discriminating circuit OC, lighting/nonlighting of the discharge lamp DL are detected to stop generation of the high voltage pulse from the igniter IG when the discharge lamp DL is lighted. When the discharge lamp DL is transferred from a lighting condition to nonlighting condition, a transistor Q3 is kept on only for the time determined by a capacitor C3 and a resistor R6. Accordingly, after the discharge lamp DL is placed in nonlighting, during the time before disappearance of a residual ion in the inside of the discharge lamp DL, generation of the high voltage pulse from the igniter IG is stopped.



---

## CLAIMS

---

[Claim(s)]
[Claim 1]A stabilizer which consists of a ** style element with which the series connection was carried out to an electric discharge lamp, and this series circuit was connected among both ends of AC power supply.
An igniter which superimposes a high voltage pulse on AC power voltage, and is impressed to an electric discharge lamp.
A lighting discrimination circuit which detects lighting and un-switching on on the light of an electric discharge lamp, and stops generating of a high voltage pulse from an igniter at the time of lighting of an electric discharge lamp.
It is the discharge lamp lighting device provided with the above, and a lighting discrimination circuit is provided with a delay means which makes generating of a high voltage pulse from an igniter start after predetermined time passes since a time of an electric discharge lamp shifting to a non-lighted condition from a lighted condition.

---

[Translation done.]

## DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application]This invention relates to the discharge lamp lighting device provided with the igniter which makes high-tension PASURU superimpose on power supply voltage, and starts an electric discharge lamp.
[0002]
[Description of the Prior Art]Conventionally, the composition shown in drawing 5 is known as this kind provided with igniter IG of a discharge lamp lighting device. That is, while carrying out the series connection of the stabilizer L set to electric discharge lamp DL from the choke coil as a ** style element and connecting this series circuit among the both ends of AC power supply AC, the high voltage pulse outputted from igniter IG is superimposed on AC power voltage via the stabilizer L.
[0003]The series circuit of resistance $R_1$ of the couple by which igniter IG was connected among the both ends of AC power supply AC, and $R_2$, Capacitor $C_1$ by which multiple connection was carried out to resistance $R_2$, and capacitor $C_2$ and switching element $Q_1$ (for example, triac) by which the series connection was carried out to primary winding $N_1$ of the stabilizer L, It has voltage response type trigger device $Q_2$ (for example, diode AC switch) and resistance $R_3$ which were connected between the node of both resistance $R_1$ and $R_2$, and the control terminal (gate) of switching element $Q_1$. Therefore, if the voltage which carried out the partial pressure of the voltage of AC power supply AC like drawing 6 (a) by resistance $R_1$ and $R_2$ exceeds the breakover voltage of trigger device $Q_2$, trigger device $Q_2$ will be turned on and current will flow into the control terminal of switching element $Q_1$ via resistance $R_3$. Then, switching element $Q_1$ is turned on and charging current $I_C$ as shown in drawing 6 (b) via primary winding $N_1$ of the stabilizer L at capacitor $C_2$ from AC power supply AC flows. If capacitor $C_2$ is charged, charging current will stop and switching element $Q_1$ will be come by off. That is, charging current $I_C$ to capacitor $C_2$ will flow into the stabilizer L until switching element $Q_2$ is turned off from the time of switching element $Q_1$ being turned on in time $t_1$ in time $t_2$. This charging current $I_C$ flows for each [ of AC power supply AC ] half cycle of every. Since charging current $I_C$ to capacitor $C_2$ flows through primary winding $N_1$ of the stabilizer L, in secondary-winding $N_2$ of the stabilizer L, the voltage which carried out pressure up of the impressed electromotive force to primary winding $N_1$ generates it. That is, a high voltage pulse occurs in secondary-winding $N_2$ of the stabilizer L, and when the voltage of AC power supply AC is overlapped on this high voltage pulse, voltage $V_{DL}$ like drawing 6 (c) is impressed to electric discharge lamp DL. Thus, electric discharge lamp DL is put into operation by impressing high tension to electric discharge lamp DL.
[0004]By the way, after electric discharge lamp DL has lit up, since it is not necessary to

generate a high voltage pulse, lighting discrimination circuit OC detects that electric discharge lamp DL lit up, and generating of the high voltage pulse from igniter IG is stopped. Current transformer CT by which the series connection of the primary winding was carried out to electric discharge lamp DL as for lighting discrimination circuit OC, Rectifier $DB_1$ which carries out full wave rectification of the secondary-winding output of current transformer CT, Capacitor $C_3$ which smooths the output of rectifier $DB_1$, and transistor $Q_3$ turned on when the both-ends voltage of capacitor $C_3$ is more than prescribed voltage, It has resistance $R_3$ which gives base current to transistor $Q_3$ according to the both-ends voltage of capacitor $C_3$, $R_4$, and rectifier $DB_2$ which is the full wave rectifiers to which the direct-current side edge was connected between the collector emitters of transistor $Q_3$. The ac side end of rectifier $DB_2$ is connected to the both ends of capacitor $C_1$ of igniter IG. Rectifier $DB_2$ is provided here in order to nonpolarity-ize switching by transistor $Q_3$.

[0005]Since current is not flowing into current transformer CT immediately after switching on AC power supply AC, transistor $Q_3$ is off and igniter IG impresses a high voltage pulse to electric discharge lamp DL by operation mentioned above. On the other hand, if electric discharge lamp DL lights up, since current will come to flow into the primary winding of current transformer CT, capacitor $C_3$ will be charged and transistor $Q_3$ will be turned on, the both ends of capacitor $C_1$ connect too hastily, and trigger device $Q_2$ comes to be maintained at OFF. That is, switching element $Q_1$ is maintained at an OFF state, and generating of the high voltage pulse from igniter IG stops it. If electric discharge lamp DL is un-switching on the light from a lighted condition by going out etc., the charging charge of capacitor $C_3$ will be immediately discharged via resistance $R_5$, transistor $Q_3$ will be come by off, and igniter IG will start operation. That is, a high voltage pulse occurs again and restarts electric discharge lamp DL.

[0006]

[Problem(s) to be Solved by the Invention]By the way, the following problems arise that it is common to be connected to a lighting device via contact button $S_1$ and $S_2$ for the purpose, such as lamp replacement, as for electric discharge lamp DL, and the contact state by contact button $S_1$ and $S_2$ is insufficient. That is, even if it is a contact state which can turn on electric discharge lamp DL at the time of start up immediately after switching on AC power supply AC, a contact state may become poor in the middle of lighting, and electric discharge lamp DL may go out. At this time, with the above-mentioned composition, lighting discrimination circuit OC detects un-switching on the light of electric discharge lamp DL, and igniter IG is started so that the high voltage pulse for a restart may be generated immediately.

[0007]On the other hand, immediately after electric discharge lamp DL goes out, ion remains to inter-electrode [ of electric discharge lamp DL ], and the time of about several 10 msec is required for remains ion to disappear. When a high voltage pulse is impressed before disappearance of remains ion, when the contact state of contact button $S_1$ and $S_2$ is insufficient, fine discharge will be started without resulting in a lighted condition, this fine discharge will continue, and current will continue flowing into contact button $S_1$ and $S_2$. When such current flows, the electrical stress to contact button $S_1$ and $S_2$ may become large, and ignition and emitting smoke may arise. If contact button $S_1$ and $S_2$ are constituted so that ignition and emitting smoke may be prevented, contact button $S_1$ and $S_2$ will be enlarged and complicated, and the problem of leading to an increase in cost will arise.

[0008]Fine discharge is prevented from producing this invention in an electric discharge lamp by generating a high voltage pulse, after it aims at solution of the above-mentioned problem and the remains ion in an electric discharge lamp disappears at the time of restart. It is going to provide the discharge lamp lighting device kept big electrical stress from requiring for a contact button

etc.
[0009]
[Means for Solving the Problem]A stabilizer which consists of a ** style element from which the series connection was carried out to an electric discharge lamp, and this series circuit was connected among both ends of AC power supply to achieve the above objects in this invention, An igniter which superimposes a high voltage pulse on AC power voltage, and is impressed to an electric discharge lamp, In a discharge lamp lighting device which it had, a lighting discrimination circuit which detects lighting and un-switching on on the light of an electric discharge lamp, and stops generating of a high voltage pulse from an igniter at the time of lighting of an electric discharge lamp a lighting discrimination circuit, After predetermined time passes since a time of an electric discharge lamp shifting to a non-lighted condition from a lighted condition, it has a delay means which makes generating of a high voltage pulse from an igniter start.
[0010]
[Function]According to the above-mentioned composition, a lighting discrimination circuit will stop generating of the high voltage pulse from an igniter, if an electric discharge lamp will be in a lighted condition, Since he is trying to make generating of the high voltage pulse from an igniter resume after predetermined time passes since the time of an electric discharge lamp shifting to a non-lighted condition from a lighted condition, After the remains ion in an electric discharge lamp disappears, it can be made to restart, when an electric discharge lamp shifts to a non-lighted condition from a lighted condition by going out etc. As a result, big electrical stress can be prevented from fine discharge not arising, even if the contact state of a terminal area with an electric discharge lamp is insufficient, and being built over a terminal area by continuation of fine discharge current. That is, an easy and small thing can be used as a contact button for connecting an electric discharge lamp, and it leads to reduction of cost.
[0011]
[Example]
(Example 1) This example inserts resistance $R_6$ for adjusting the charging time value of the charging charge of capacitor $C_3$ between the nodes of capacitor $C_3$ and resistance $R_5$ in lighting discrimination circuit OC shown in drawing 5, as shown in drawing 1. The damping time constant by capacitor $C_3$ and resistance $R_6$ is suitably set up here according to time for remains ion to disappear after putting out lights of electric discharge lamp DL. That is, a delay means is constituted by capacitor $C_3$ and resistance $R_6$. Other composition is the same as composition conventionally which was shown in drawing 5.
[0012]Next, operation is explained. Since lamp current $I_{DL}$ is not flowing like [ electric discharge lamp DL is a non-lighted condition, and ] drawing 2 (a) when AC power supply AC is switched on by time $t_3$ as shown in drawing 2, current does not flow into the primary winding of current transformer CT. Therefore, voltage does not occur to the both ends of capacitor $C_3$ like drawing 2 (b), but transistor $Q_3$ is OFF like drawing 2 (c) (drawing 2 (c) shows the collector to emitter voltage of transistor $Q_3$), and igniter IG operates. That is, a high voltage pulse occurs repeatedly until electric discharge lamp DL lights up like drawing 2 (d). If electric discharge lamp DL lights up by time $t_4$, lamp current $I_{DL}$ will flow like drawing 2 (a), Since capacitor $C_3$ is charged like drawing 2 (b) and both-ends voltage rises, transistor $Q_3$ is turned on like drawing 2 (c), and generating of the high voltage pulse from igniter IG stops like drawing 2 (d).
[0013]On the other hand, in the lighted condition of electric discharge lamp DL, if it shifts to a non-lighted condition by going out etc. in time $t_5$ as shown in drawing 2 (a), the charging charge of capacitor $C_3$ will be discharged according to the damping time constant determined by capacitor $C_3$ and resistance $R_6$ like drawing 2 (b). If it falls until it becomes impossible for the terminal voltage of capacitor $C_3$ to maintain the ON state of transistor $Q_3$ in time $t_6$, Transistor $Q_3$ is come by off like drawing 2 (c), a high voltage pulse occurs again from igniter IG like drawing

2 (d), and it is going to restart electric discharge lamp DL. In here, after electric discharge lamp DL shifts to a non-lighted condition from a lighted condition, the damping time constant determined by capacitor $C_3$ and resistance $R_6$ is set up, as transistor $Q_3$ has been maintained at an ON state for a long time rather than the time when the remains ion inside electric discharge lamp DL disappears to be a grade. Therefore, fine discharge is prevented from a high voltage pulse occurring from igniter IG, and arising in electric discharge lamp DL, before electric discharge lamp DL shifts to a non-lighted condition from a lighted condition and remains ion disappears. As a result, even if big electrical stress is prevented from fine discharge current flowing into contact button $S_1$ and $S_2$, and being built and it uses an easy and small thing as contact button $S_1$ and $S_2$, emitting smoke and ignition do not arise, and it leads to reduction of cost. Since other composition and operations are the same as composition conventionally which was shown in drawing 5, they omit explanation.

[0014](Example 2) In this example, as shown in drawing 3, timer circuit T is provided as a delay means. Only the fixed time which this timer circuit T requires a trigger in falling of an input signal, and is determined by resistance $R_7$ and capacitor $C_4$ in an output is a one-shot-multivibrator circuit set as H level, It is constituted using integrated circuit IC for general-purpose timers (for example, NEC muPC1555 grade). That is, if terminal ** connected to the anode of capacitor $C_3$ falls from H level to L level, timer circuit T will start output terminal ** on H level from L level, and will bring down output terminal ** on L level from H level after fixed time. The anode of capacitor $C_3$ and output terminal ** of timer circuit T are connected via diode $D_1$ and $D_2$ at the node of resistance $R_4$ and $R_5$, respectively. Electric power is separately supplied to timer circuit T.

[0015]During lighting of electric discharge lamp DL, like Example 1, lamp current $I_{DL}$ is detected by current transformer CT, and capacitor $C_3$ is charged. Therefore, transistor $Q_3$ is turned on and generating of the high voltage pulse from igniter IG stops. On the other hand, if electric discharge lamp DL shifts to a non-lighted condition from a lighted condition by going out, the both-ends voltage of capacitor $C_3$ will fall on L level from H level, and when the input of timer circuit T falls, only in fixed time, the output of timer circuit T will become H level. Namely, even if lamp current $I_{DL}$ is no longer detected by current transformer CT and the terminal voltage of capacitor $C_3$ falls by it, Since transistor $Q_3$ is maintained at one by the output of timer circuit T, a high voltage pulse does not generate fixed time from igniter IG with it in the meantime. Therefore, a high voltage pulse is prevented from occurring from igniter IG, and fine discharge current is prevented from flowing into contact button $S_1$ and $S_2$ until electric discharge lamp DL will be in a non-lighted condition and internal remains ion disappears. Other composition and operations are the same as that of Example 1.

[0016](Example 3) This example distinguishes lighting and un-switching on the light by lighting discrimination circuit OC based on both-ends voltage $V_{DL}$ of electric discharge lamp DL, as shown in drawing 4. That is, the partial pressure of the both-ends voltage $V_{DL}$ of electric discharge lamp DL is carried out by resistance $R_8$ by which multiple connection was carried out to electric discharge lamp DL, and $R_9$, and the terminal voltage of resistance $R_9$ is rectified by rectifier $DB_1$. The output of rectifier $DB_1$ is charged by capacitor $C_3$ via resistance $R_{10}$, and the terminal voltage of capacitor $C_3$ is compared with reference voltage $V_{REF}$ by comparator CP. Comparator CP is constituted so that an output may be used as H level, when the terminal voltage of capacitor $C_3$ is lower than reference voltage $V_{REF}$. Reference voltage $V_{REF}$ is set as the pressure value between the terminal voltage of capacitor $C_3$ of the time of no-load, and the time of lighting.

[0017]Therefore, since it is high and both-ends voltage $V_{DL}$ of electric discharge lamp DL

becomes higher than reference voltage $V_{REF}$ during the period before electric discharge lamp DL lights up immediately after switching on AC power supply AC in the terminal voltage of capacitor $C_3$, the output of comparator CP is set to L level. At this time, transistor $Q_3$ is off and a high voltage pulse is outputted from igniter IG. In this way, if electric discharge lamp DL lights up, since both-ends voltage $V_{DL}$ of electric discharge lamp DL falls, the terminal voltage of capacitor $C_3$ will fall, the output of comparator CP will be set to H level, transistor $Q_3$ will be turned on, and generating of the high voltage pulse from igniter IG will stop.

[0018]In the lighted condition of electric discharge lamp DL, if electric discharge lamp DL goes out by going out etc., Since it will be in an unloaded condition and both-ends voltage $V_{DL}$ of electric discharge lamp DL goes up, Capacitor $C_3$ is charged with the damping time constant determined by resistance $R_{10}$ and capacitor $C_3$, and transistor $Q_3$ is maintained at an ON state time until the terminal voltage of capacitor $C_3$ exceeds reference voltage $V_{REF}$. That is, the period until electric discharge lamp DL is un-switching on the light and remains ion disappears can stop generating of the high voltage pulse from igniter IG. Other composition and operations are the same as that of Example 1.

[0019]

[Effect of the Invention]This invention to the lighting discrimination circuit which will stop generating of the high voltage pulse from an igniter as mentioned above if an electric discharge lamp will be in a lighted condition. Since the delay means is established so that generating of the high voltage pulse from an igniter may be made to resume after predetermined time passes since the time of an electric discharge lamp shifting to a non-lighted condition from a lighted condition, After the remains ion in an electric discharge lamp disappears, it can be made to restart, when an electric discharge lamp shifts to a non-lighted condition from a lighted condition by going out etc. As a result, even if the contact state of a terminal area with an electric discharge lamp is insufficient, fine discharge does not arise, and the effect that big electrical stress can be prevented from being built over a terminal area by continuation of fine discharge current is done so. That is, an easy and small thing can be used as a contact button for connecting an electric discharge lamp, and there is an advantage of leading to reduction of cost.

---

[Translation done.]

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a circuit diagram showing Example 1.
[Drawing 2]It is an explanatory view of operation showing Example 1.
[Drawing 3]It is a circuit diagram showing Example 2.
[Drawing 4]It is a circuit diagram showing Example 3.
[Drawing 5]It is a circuit diagram showing a conventional example.
[Drawing 6]It is an explanatory view of a conventional example of operation.
[Description of Notations]
AC AC power supply
$C_3$ capacitor
DL Electric discharge lamp
IG Igniter
L Stabilizer
OC Lighting discrimination circuit
$R_6$ resistance

[Translation done.]

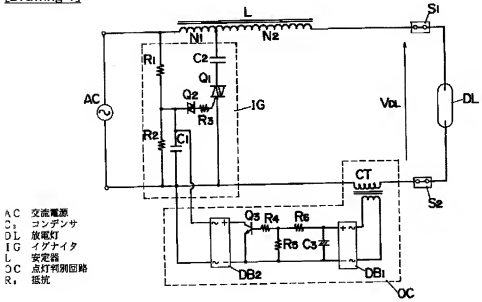
* NOTICES *

JPO and INPIT are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

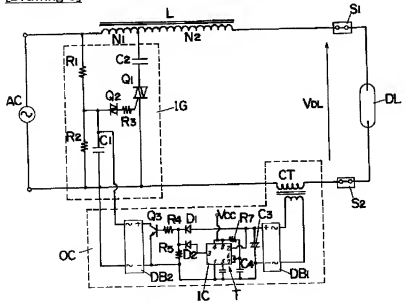
## DRAWINGS

[Drawing 1]



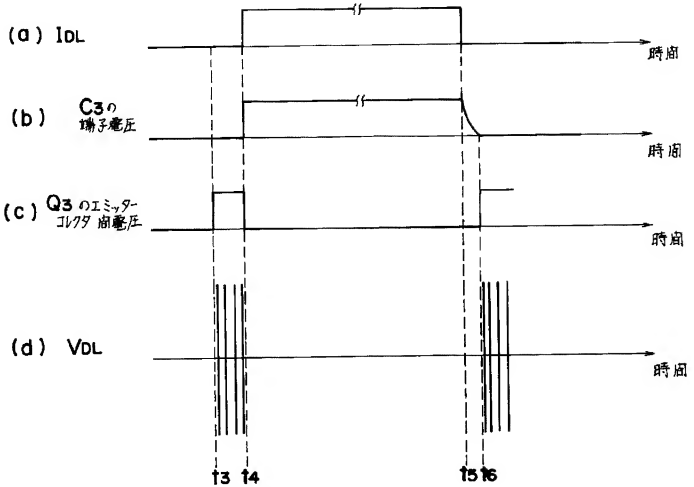

AC 交流電源
C1 コンデンサ
DL 放電灯
IG イグナイタ
L 安定器
OC 点灯判別回路
R1 抵抗

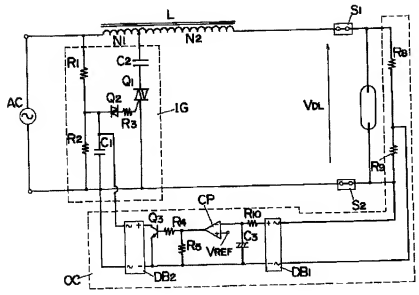
[Drawing 3]



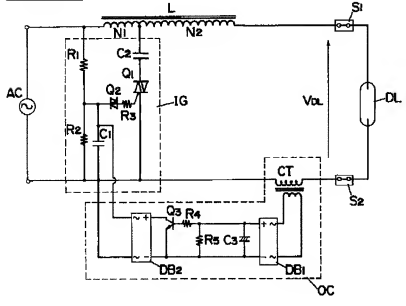

[Drawing 2]

[Drawing 4]

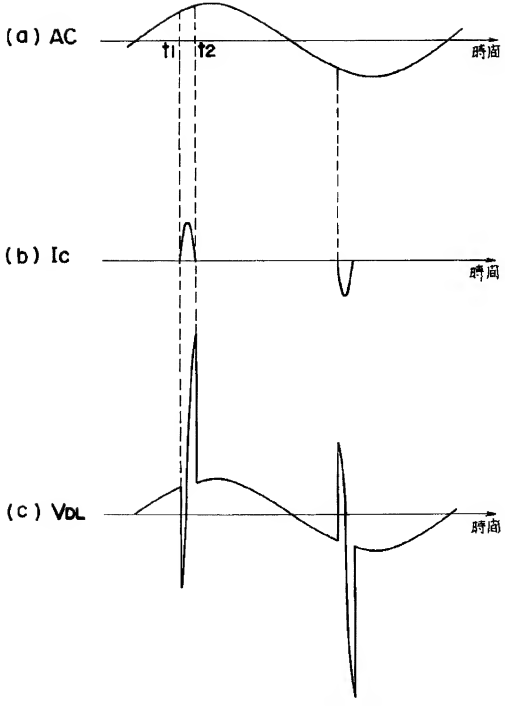





[Drawing 5]




[Drawing 6]




[Translation done.]